3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during year

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
1	Dr Bandita Naik	Water Resources				National	2022	ISBN: 9798887339337	Methodist College of Engineering and Technology, Hyderabad	Notion Press
2	Dr Bandita Naik	A text book of Environmental Science				International	2022	978-93-5625-397-1	Methodist College of Engineering and Technology, Hyderabad	SIP Publisher
3	Dr Bandita Naik	Introduction to Climate Change				National	2022	978-620-5-49149-2	Methodist College of Engineering and Technology, Hyderabad	LAP LAMBERT Academic Publishing
4	Dr Bandita Naik		Rainfall–Run off Studies of Brahmani River Basin Using ANN		International Conference HYDRO-2018-INTERNATIONAL.	International	2022	978-3-030-81357-4	Methodist College of Engineering and Technology, Hyderabad	

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
5	Dr Bandita Naik		Loss Coefficient of Expansion in Diverging Channel River Hydraulics		International Conference HYDRO-2018-INTERNATIONAL.	International	2022	978-3-030-81767-1	Methodist College of Engineering and Technology, Hyderabad	Part of the Water Science and Technology Library book series
6	Srikanth Renikunta		Renewable Energy a Renewable Step Towards Sustainability			International	2021	978-1-956102-78-9	Methodist College of Engineering and Technology, Hyderabad	INSC International Publisher
7	Dr Diana Moses, Dr Gladson Maria Britto,Dr Md Ashfaqul Hasan	Concepts of computational intelligence using machine learning				National	2022	978-93-92537-28-8	Methodist College of Engineering and Technology, Hyderabad	Bonfring
8	Dr Diana Moses, Dr M Jawahar, Dr Gladson Maria Britto	Software process and project management				National	2022	978-93-5611-537-8	Methodist College of Engineering and Technology, Hyderabad	BlueRose One publishers

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
9	G.Saritha, L.Thirupathi Dr.D,Rambabu, Dr.Thejoram Naresh Reddy	Computer Networks and Simulation				National	2022	978-93-5574-320-6	Methodist College of Engineering and Technology, Hyderabad	Walnut Publications
10	Dr. Syed Azahad, Dr. Dinesh G., Dr. Pillai Lalitha Kumari, Dr. Mahesh Lokhande	Soft Computing				National	2022	978-93-9430-404-2	Methodist College of Engineering and Technology, Hyderabad	GCS Publishers
11	Dr. Syed Azahad, Dr. Thomman Vijaya Saradhi, Mr. Sreejith R, Dr. Sreekumar Narayanan	Fundamentals of Data Analytics				National	2022	978-93-9430-438-3	Methodist College of Engineering and Technology, Hyderabad	GCS Publishers
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13	Er Sandeep Ravikanti	Computer organization and 8086 microprocessor				National	2022	ISBN: 9781685634605	Methodist College of Engineering and Technology, Hyderabad	Notion press

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
14	Er Sandeep Ravikanti	Internet Technologies				National	2022	ISBN13: 9789391522964 ISBN10: 9391522963	Methodist College of Engineering and Technology, Hyderabad	Walnut Publications
15	Mr. Namburi Nireekhana	Power Electronics Applications to Power Systems		NA	NA	International	2022	ISBN: 978-620-0-23931-0	Methodist College of Engineering & Technology	LAP LAMBERT Academic Publishing
16	Mr. Namburi Nireekhana	Novel topologies in Power Electronics with Matlab Solutions		NA	NA	International	2022	ISBN: 978-613-9-90879-0	Methodist College of Engineering & Technology	LAP LAMBERT Academic Publishing
17	Dr. Bhukya Laxman	Single-phase seven-level inverter with multilevel boost converter for solar photovoltaic systems		ICPC2T	2022 Second International Conference on Power, Control and Computing Technologies (ICPC2T)	International	2022	SBN:978-1-6654-5859-7	Methodist College of Engineering & Technology	IEEE

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
18	Dr.A.Arunkumar	Advances in Science, Technology and Innovations/ Growth and Characterization of pure and 2-picolinic acid doped L-lysine monohydrochloride Single Crystals				National	2022	978-93-93737-59-5	Methodist College of Engineering & Technology	Shanlax Publications
19	Dr.A.Arunkumar	Advances in Science, Technology and Innovations/ Influence of Manganese (Mn) and Dysprosium (Dy) Doping on the Magnetic Properties of Yttrium Iron Oxide (YFeO3) Multiferroic Materials				National	2022	978-93-93737-59-5	Methodist College of Engineering & Technology	Shanlax Publications

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20	Dr.K. Veerabhadra Rao	Introduction to Ionic Conductivity of Glasses				International	2022	978-3-659-29862-2	Methodist College of Engineering & Technology	Lambert Academic Publishing: OmniScriptum GmbH & Co. KG, Germany,
21	Dr.K. Veerabhadra Rao	Physics for Freshman Engineers				International	2022	978-620-4-95663-3	Methodist College of Engineering & Technology	Lambert Academic Publishing: OmniScriptum GmbH & Co. KG, Germany,
22	Dr. M Uday Kumar	A Novel analysis and developments in Heat Exchangers	NA	NA	NA	International	2021	ISBN: 978-620-4-20415-4	Methodist College of Engineering and Technology, Hyderabad	lambert academic publishing
23	Dr. M Uday Kumar	NA	Comparative study of Plain and Twisted ducts in Heat transfer	(Springer)Comparative study of Plain and Twisted ducts in Heat transfer	3 rd International Conference on Intelligent Manufacturing and Energy Sustainability	International	2021	ISBN:978-981-16-6481-6 e-book ISBN 978-981-16-6482-3	Methodist College of Engineering and Technology, Hyderabad	Intelligent Manufacturing and Energy Sustainability Smart ,Innovations systems and technology

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24	Saigayathri lahari .P	NA	Experimentation and study of Metal Spinning of pure copper by using Taguchi methodology and Regression analysis	Experimentation and study of Metal Spinning of pure copper by using Taguchi methodology and Regression analysis	The Journal of oriental Research Madras	National	2022	ISSN : 0022-3301	Methodist College of Engineering and Technology, Hyderabad	The Journal of oriental Research Madras
25	Dr. M .Prasad,Y.Madhu Maheswara reddy T.Dheeraj Reddy	Explicit analysis of an automobile chasis when collision	NA	NA	NA	International	2022	9786204745817	Methodist College of Engineering and Technology, Hyderabad	lambert academic publishing
26	Y.Madhu Maheswara reddy.Dr.Matam Prasad	Design analysis and fabrication of GOKART	NA	NA	NA	International	2022	9798886065619	Methodist College of Engineering and Technology, Hyderabad	lambert academic publishing

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27	Dr. Md. Fakhruddin Hasan Nizami	Performance, Emission and Combustion Analysis on Single Cylinder CI Engine using Dual Bio-Diesel with and without Hydrogen Induction	NA	NA	NA	International	2022	9783346638540	Methodist College of Engineering & Technology	GRIN Publisher, Munich-Bavaria State, Germany
28	Dr. Md. Fakhruddin Hasan Nizami	Air Craft Air Conditioning System: Description	NA	NA	NA	International	2022	9786202055253	Methodist College of Engineering & Technology	LAP LAMBERT Academic PublishingOmniScriptum SRL Str. Armeneasca 28/1, office 1 Chisinau, MD-2012, Republic of Moldova

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29	Dr. Md. Fakhruddin Hasan Nizami	Heating Ventilation & Air conditioning-Maintenance	NA	NA	NA	International	2022	9786202054935	Methodist College of Engineering & Technology	LAP LAMBERT Academic PublishingOmniScriptum SRL Str. Armeneasca 28/1, office 1 Chisinau, MD-2012, Republic of Moldova
30	Dr. Md. Fakhruddin Hasan Nizami	Fire Fighting System Designing	NA	NA	NA	International	2022	9786202055017	Methodist College of Engineering & Technology	LAP LAMBERT Academic PublishingOmniScriptum SRL Str. Armeneasca 28/1, office 1 Chisinau, MD-2012, Republic of Moldova

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31	Dr.P.Prabhuraj, S. Rajakumar	Microstructure and Fracture Toughness Behaviour of Stir Zone of Friction Stir Welded Joint of AA7075 T651.	NA	NA	NA	National	2022	NA	Methodist College of Engineering and Technology	WELD FAB TECH, Bangalore, India

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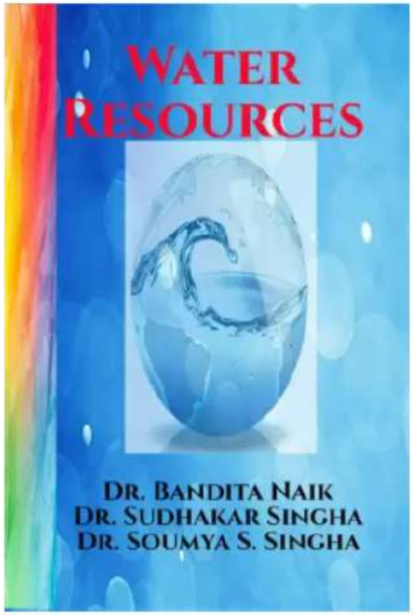

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A Textbook of Environmental Science

A Textbook of Environmental Science

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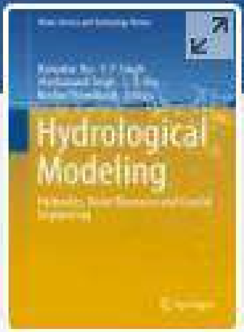

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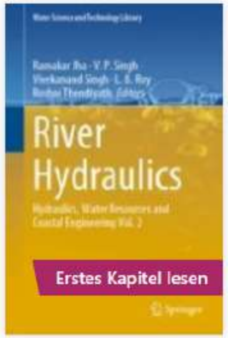

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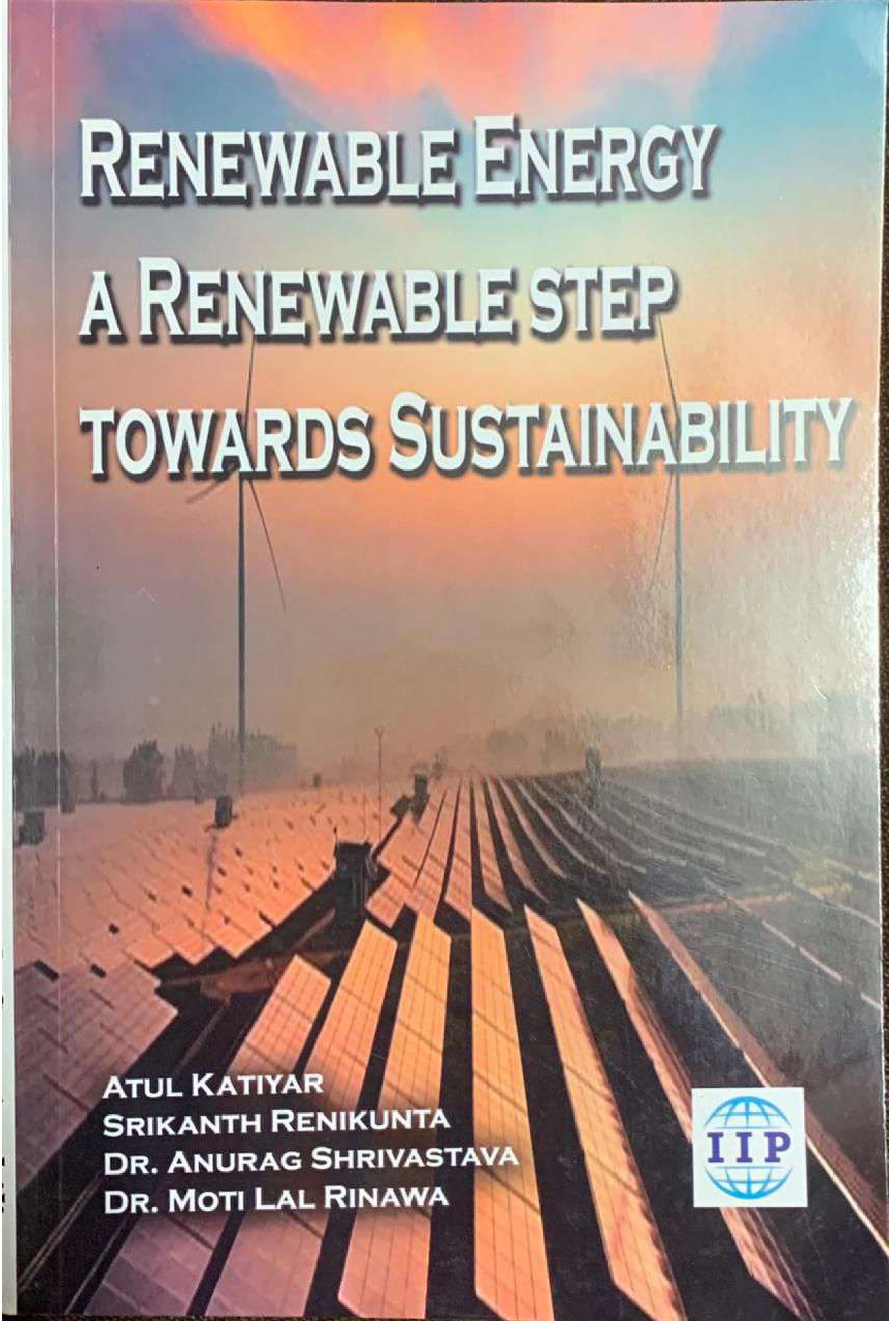
Abstract

In this present work, a hydraulic study was done on the expansion section of the Kaskaskia river, Illinois (USA) (Nani G. Bhowmik). The set of flow variables was collected from the Kaskaskia river, on Reach-1. Investigation on loss coefficient was done on the two expansion sections of angle of 0.50° and 0.17°, respectively. This study was done to understand the effects of the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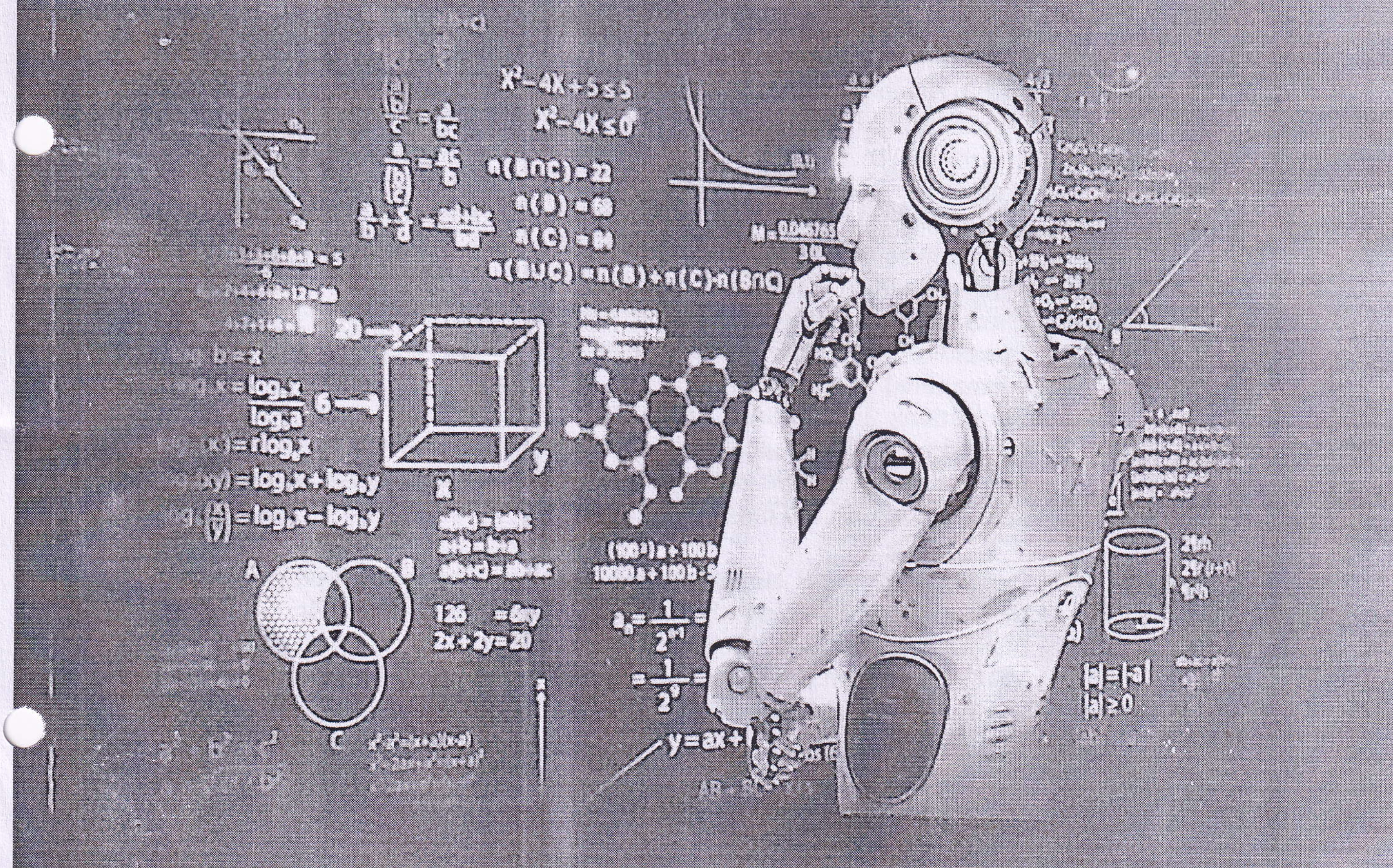

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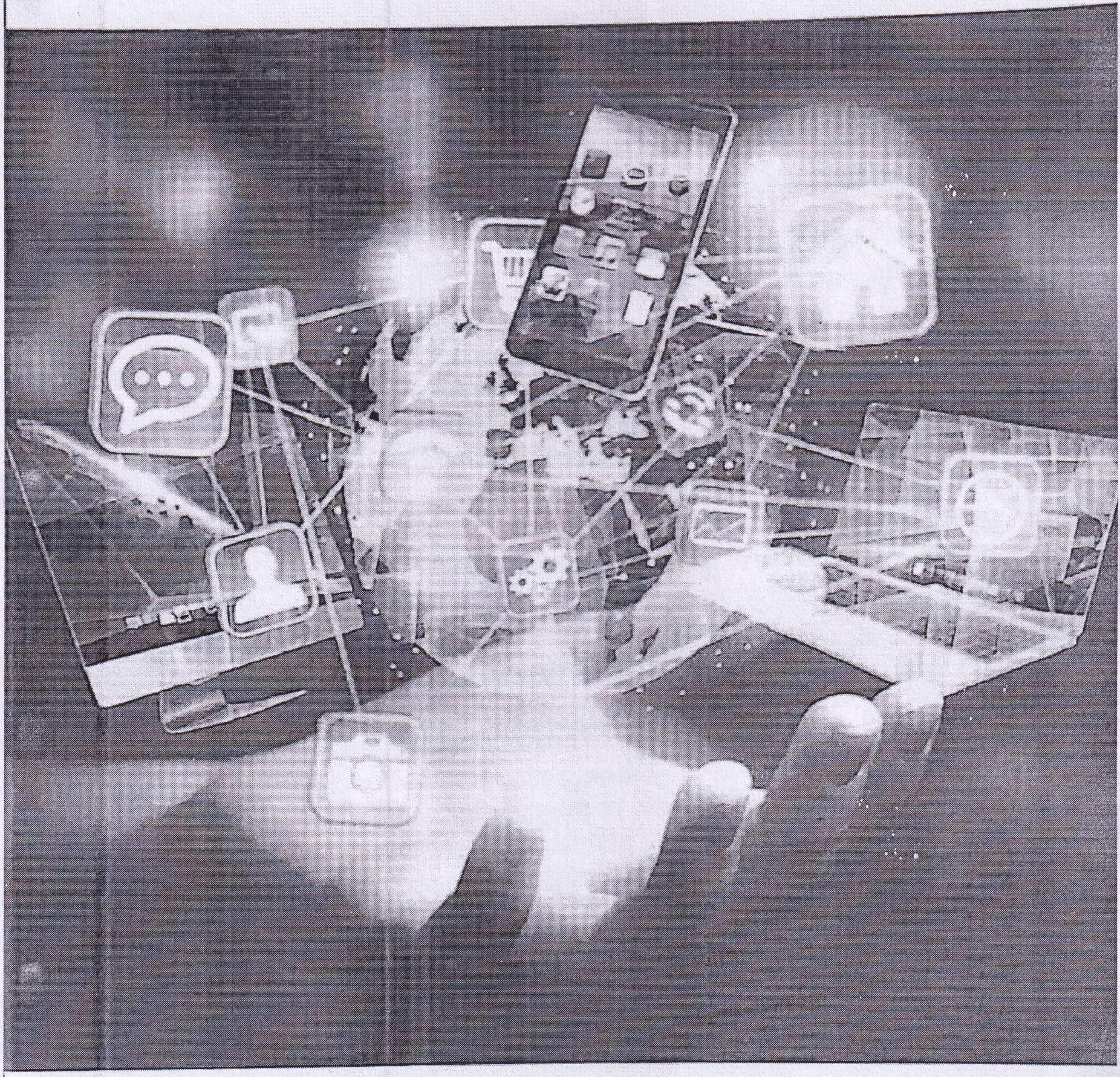

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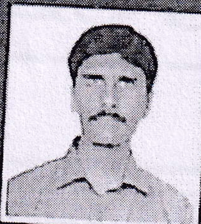

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INTRODUCTION TO INTERNET OF THINGS: A THEORETICAL APPROACH

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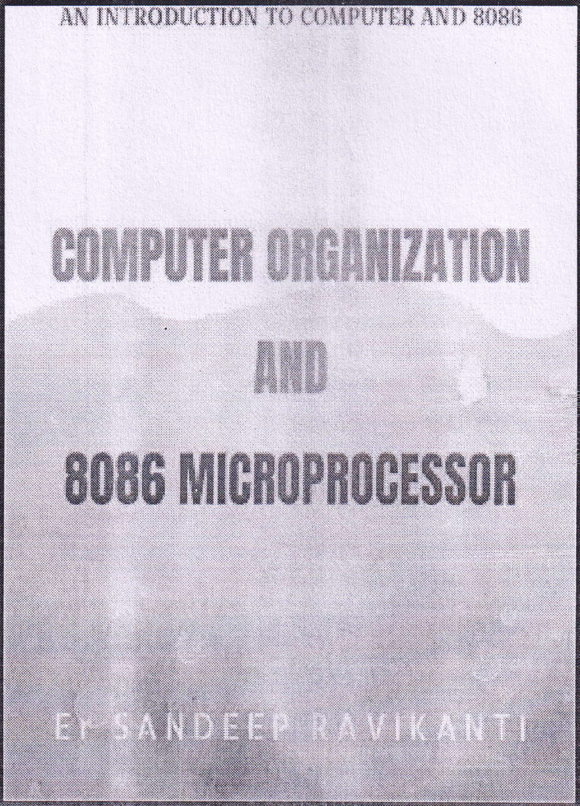
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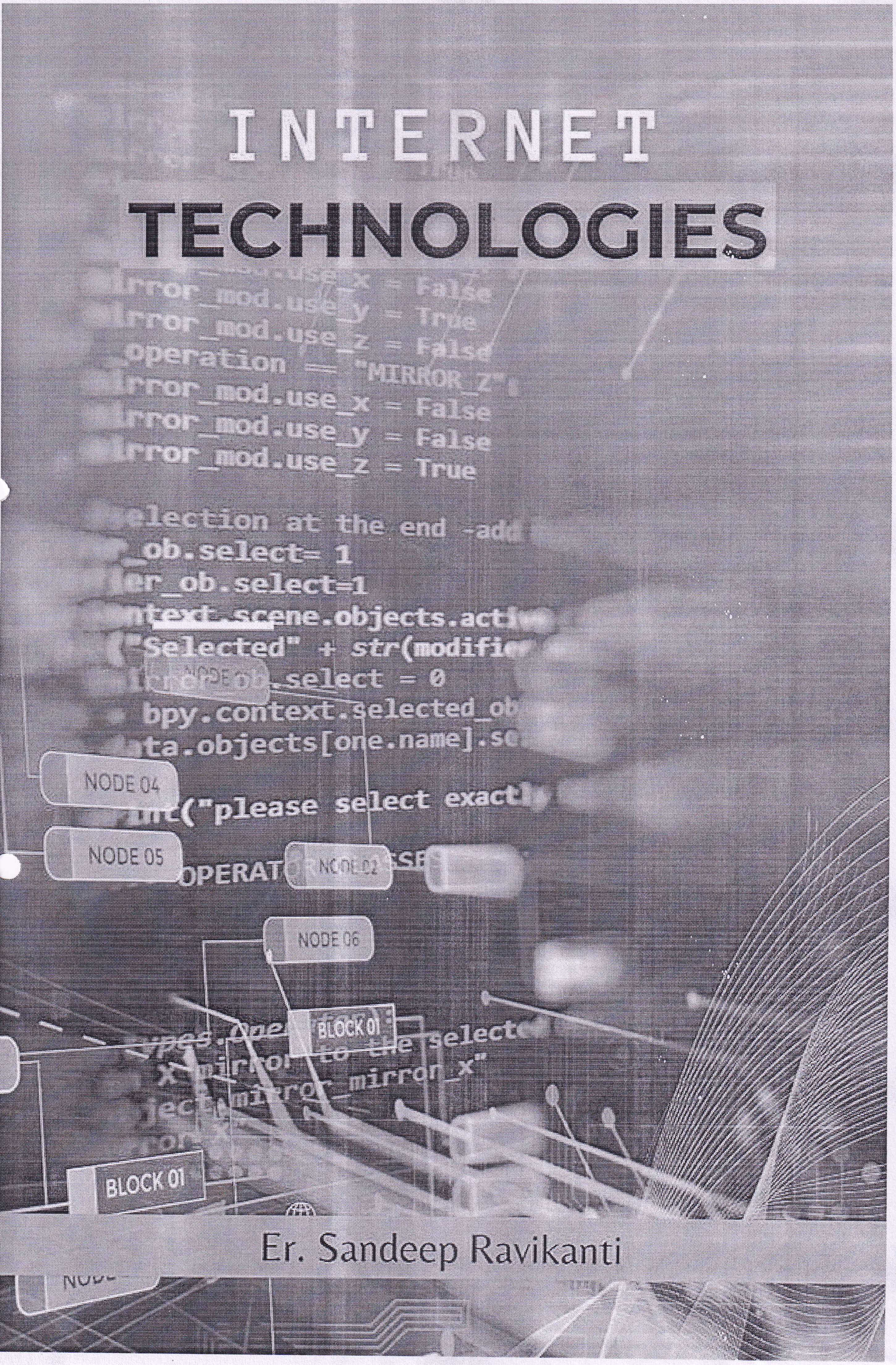

Er. Sandeep Ravikanti

Internet Technologies are playing a key role due to the power of networks and various advanced technologies for Web based and mobile based applications development. This book mainly focuses on the internet technology fundamentals. Which are essentially required for all the Web Developers and Designers. This book allows us to learn and develop the web based applications which allows us to communicate with the outside world with the technologies like World Wide Web(WWW), HTML & CSS3, JavaScript and AJAX. This book helps the users those who wants to learn and start career in Web Development. This book is having the real time examples of web and database concepts. Which are really useful for the programmers and users.

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Er. Sandeep Ravikanti is the academician, Researcher, Instructor, speaker and technical trainer and having 10 years of teaching experience in industry and academia. He received his M.Tech(CSE) Degree from JNTU Hyderabad. He is awarded with "Er" title from engineering council of India (ECI) in 2019.

He successfully filed and published 4 Patents from Indian patent office to his credit. He has published almost 30+ research papers in various reputed International Journals which were indexed in Scoops, Springer and UGC. He has been nominated for Telangana Technical Education Young Scientist Award 2021. Successfully completed and received almost 100+ MOOCS certificates in various courses from top universities like University of Michigan, Coventry, Leeds, and Institute of coding and Industry like Accenture, CISCO, Microsoft etc. He is working as editorial board member for various International Journals in the field of Computer Science. His Research areas include Internet of Things and Cyber Security. He has rich experience in Microprocessor, computer organization, Web programming and Python.

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In recent years, power quality disturbances become most issue which makes many researchers interested to find the best solutions to solve it. Power quality in the power system is the important issue for industrial, commercial and residential applications today. The voltage problem is mainly considered from under-voltage (voltage sag) condition over current caused by short circuit or fault somewhere in the system. In customer opinion a power problem is deviation in voltage, current and frequency that results in failure.Power electronic converters have been developed several tenths of years ago for many types of applications. One of its major applications is for control of electrical machines, mainly used in the beginning for industrial applications, and now propagated in many household appliances. The beginning of the renewable energy story had a moderate influence on the power electronic converters market. Indeed, in the old small wind turbines, the mechanical power was converted to electrical power thanks to induction machines directly connected to the grid. Very quickly, the power of the wind turbine increased and more rules were implemented.

PE Applications to Power systems (PEAPS)

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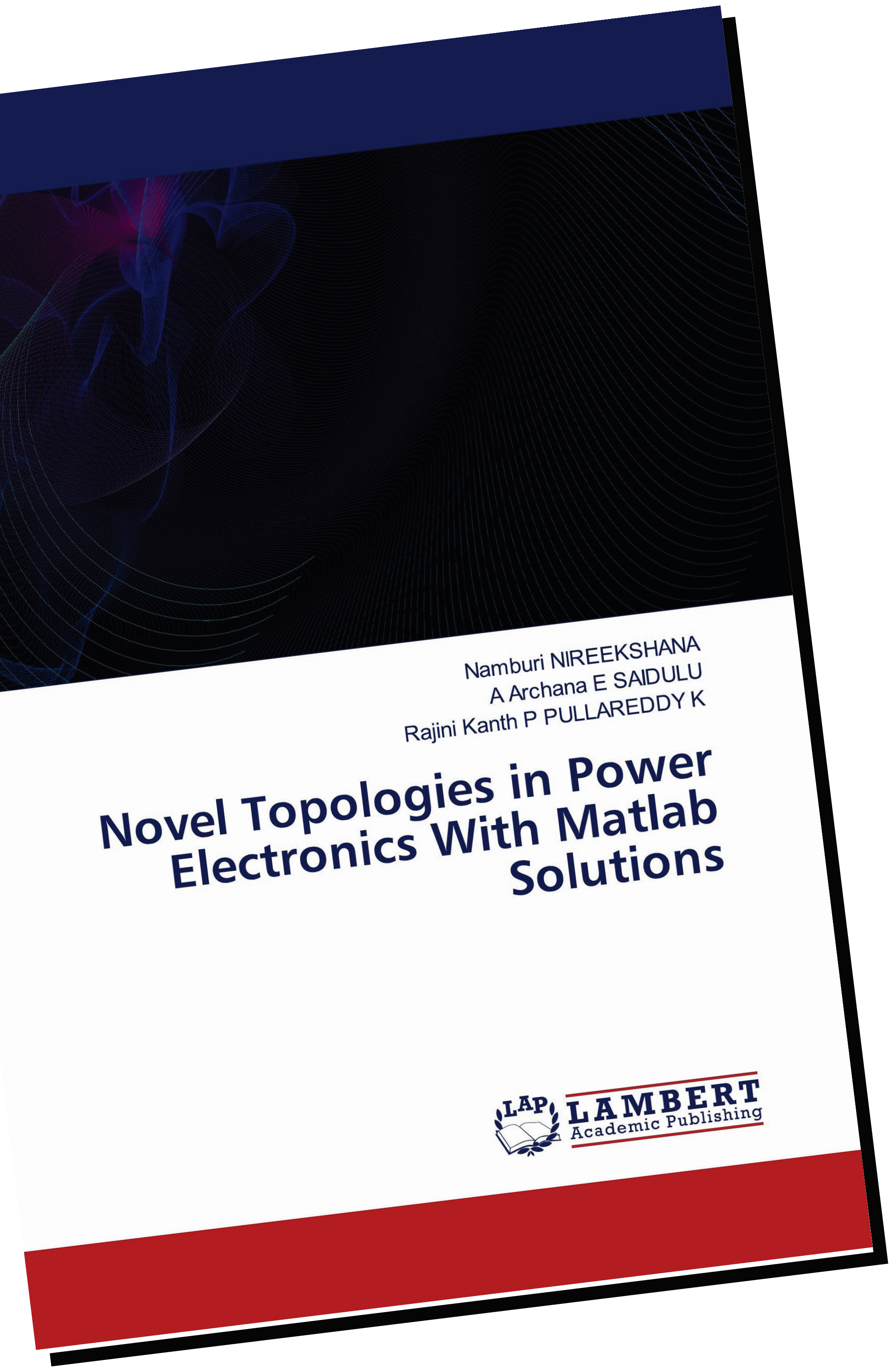

Novel Topologies in Power Electronics With Matlab Solutions

Namburi NIREEKSHANA

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Power electronic converters have been developed several tenths of years ago for many types of applications. One of its major applications is for control of electrical machines, mainly used in the beginning for industrial applications, and now propagated in many household appliances.

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Single-phase seven-level inverter with multilevel boost converter for solar photovoltaic systems

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Abstract — **Multilevel inverters are a viable solution for meeting rising power needs at both the generating and utility levels. The magnitude of the voltages produced in the solar photovoltaic (PV) systems is also low. This paper presents a two-stage seven-level inverter for solar PV systems with a three-level boost converter for boosting the input voltage for the inverter. The proposed inverter is compact in size and is capable of delivering a peak voltage magnitude of six times the input voltage. The control signals for this topology are generated using conventional sinusoidal pulse-width modulation techniques. The proposed topology is modular and can also be cascaded to produce higher voltage levels, or it can be configured to operate as a seven-level inverter with a higher output voltage gain, as dictated by the control signals. A detailed comparison of the proposed topology with conventional inverter topologies are also presented. The simulations are carried out in MATLAB/Simulink environment and the results are presented.**

Keywords—Multilevel, Boost converter, photovoltaic, cascaded, modular.

I. INTRODUCTION

Photovoltaic (PV) systems has become increasingly popular these days because of their benefits in terms of inexhaustible availability, pollution-free operation, and ease of use [1]-[2]. Inverters, as a key component of solar systems, play a critical part in lowering harmonic performance and increasing system efficiency [3]. Due to their unique qualities, multilevel inverters (MLIs) are more appropriate for PV systems than traditional two-level inverters [4–6]. Lesser dv/dt, reduced device voltage stress, improved output waveform quality, and smaller filter inductance are all advantages of multilevel inverters [7–9]. These advantages make it easier to handle photovoltaic application demands.

The potential of photovoltaic-based renewable energy sources has been proved, with around 700 GW of solar capacity produced globally by 2020. The rising penetration of PV-based RES into the electric grid has piqued researchers' interest, resulting in the creation of compact, extremely dependable, reduced cost, and highly efficient grid-connected solar power production systems. Multilevel inverters have been under development for over three decades and have successfully been applied to a wide range of industrial applications [10]. The primary reason for their quick adoption as a viable choice is that they enable users to overcome issues related to semiconductor device voltage and current ratings in high and medium power applications, which is a distinct advantage [11].

Because of their simple construction and higher effectiveness, two-level single-stage structure associated PV inverters are broadly utilized in enterprises and private applications. In two-level single-stage inverter structures, environmentally friendly power sources like PV/fuel cell units are normally allied in series to meet the network maximum voltage. Nevertheless, these inverters have various downsides, including uninhibited maximum power point tracking (MPPT), an awkwardness in power sharing because of incomplete overshadowing, which causes the non-concealed PV board to overheat, and a lower level of functional safety [12]. It likewise requires high voltage-rated power semiconductor switches and has a low result power quality.

Therefore, two-stage power transformation has filled in ubiquity, and by using a frontend DC-DC converter stage, it is equipped for tending to the downsides of single-stage inverters. To accomplish the structure of highest voltages, it enhances the lower PV voltage to a higher DC link voltage and afterward changes it over to AC. Besides, when contrasted with single-stage inverters, two-stage inverters achieve fewer series-associated PV panels and has good MPPT performance [13] - [16].

In the field of grid-tied low-power renewable energy systems, MLIs are gaining popularity. By connecting multiple DC sources in series, the PWM can sum up the output waveforms close to the sine wave. They are attaining attractiveness due to the demand for lower power devices, filtering components and high quality output power from a harmonics perspective. Therefore, they are the preferred choices to limit the problems associated with two-stage inverters. In the literature, cascaded H-Bridge (CHB), neutral-point clamped (NPC) and flying capacitor (FC) are the most common MLIs. The larger number of devices, the difficulty of balancing the DC voltage, and the increasing level of control complexity are limitations of these MLIs [17]-[18].

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A two-stage MLI for single-phase PV generating systems is presented in this article. The proposed topology incorporates a multilevel boost converter (MLBC) to increase the PV system voltage, which is then fed to the H-bridge inverter through switches. Traditional sinusoidal pulse width modulation with level shifted carriers are employed for generating control pulses for the switches in the proposed topology. The detailed working principle and operating stages are presented in the following sections.

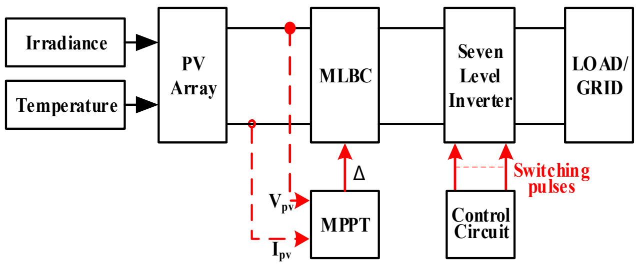


Fig. 1. Block diagram representation of the proposed solar PV Inverter system.

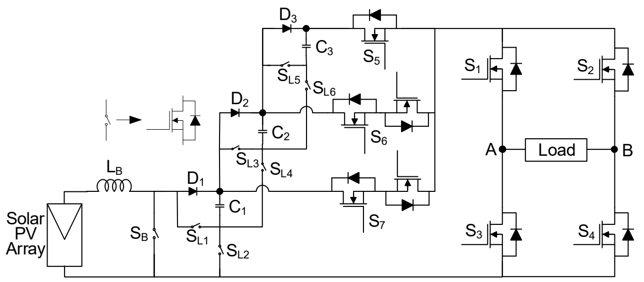


Fig. 2. Proposed seven-level inverter topology with boosting circuit.

II. Proposed Multilevel Topology

A. Construction of the proposed inverter:

The solar PV arrays are connected in series and parallel to increase the voltage and current magnitudes respectively. But it is not feasible all the time to increase the series connected arrays to obtain the rated output voltage. Hence a multilevel boost converter (MLBC) is employed to boost the voltage to required level in the proposed topology. The fundamental schematic arrangement of the proposed two-stage seven-level PV inverter is shown in Figure 1. This two-stage configuration comprises of a MLBC, H-Bridge and series connected switches. The switches are employed to bridge the connection between the MLBC and the H-Bridge. The advantages of the proposed topology is that the voltage stress across the devices is low and the voltage across the dc link capacitors can be maintained at a desired value to yield symmetric seven-level voltage waveform across the output terminals. Clamping diodes are employed to ensure dc link capacitor voltage balancing.

The proposed MLI topology can be divided into three stages such as source, MLBC and the Inverter topology. The solar PV array is used as the source and the output of the solar PV array is fed to a boost converter. The switch SB in the boost converter is operated at a high frequency in the range of 20kHz with 50 percent duty cycle such that the output voltage across the switch is twice the source voltage. This voltage is fed to MLBC where each capacitor is charged to this magnitude with the help of the switches S_{L1} to S_{L6} and clamping diodes.

MLBC is the important component in the proposed topology and is responsible for the level generation. The capacitors C1, C2 and C3 are charged during zero voltage level of the output and is involved in generation of required voltage levels. The output of the solar PV array is fed to a boost converter which boost the voltage to twice the value of input. The capacitors C1, C2 and C3 are charged to this voltage by turning on the switches SL2, SL4 and SL6. Once the capacitors are charged, based on the required voltage to be generated, the capacitors are switched.

An N-level MLBC is a DC–DC converter based on pulse-width modulation (PWM) that combines a boost converter and the switching capacitor function to provide numerous output voltages. MLBC has the advantage of blocking just one voltage level per device, allowing high-voltage to be achieved with low-voltage devices without the use of heavy duty cycles or transformers. The structure is modular, and depending on the output ac voltage demand, it can be extended to any number of voltage levels. A three-level MLBC is used in the suggested topology.

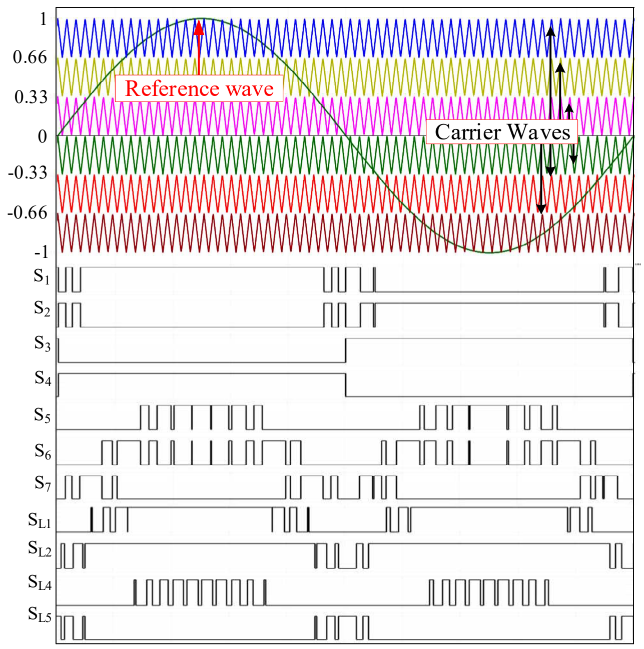


Fig. 3. Modulation technique employed for the proposed topology and the corresponding gate pulses for the inverter switches.

TABLE I. Switching States of the Inverter

State	S_1	S_2	S_3	S_4	S_5	S_6	S_7	Voltage Magnitude	Output Voltage
1	1	0	0	1	1	0	0	$V_1+V_2+V_3$	V_{dc}
2	1	0	0	1	0	1	0	V_2+V_3	$(2/3)V_{dc}$
3	1	0	0	1	0	0	1	V_3	$(1/3)V_{dc}$
4	1	1	0	0	0	0	0	0	0
5	0	0	1	1	0	0	0		
6	0	1	1	0	0	0	1	V_3	$-(1/3)V_{dc}$
7	0	1	1	0	0	1	0	V_2+V_3	$-(2/3)V_{dc}$
8	0	1	1	0	1	0	0	$V_1+V_2+V_3$	$-V_{dc}$

B. Modulation technique:

The gate signals for the metal-oxide semiconductor field-effect transistor (MOSFET) semiconductor switches in inverter topology are generated by conventional sinusoidal PWM techniques. High frequency triangular carrier waves are compared with fundamental frequency sinusoidal reference signal to generate the control pulses. For seven level operation, the number of carrier waves required are six. These six carrier signals are level shifted one over the other with a magnitude equal to the magnitude of each carrier wave. Three carriers are used to generate pulses for switches operating during positive half cycle of the output voltage and hence these carriers are placed above the reference point. Similarly, the other three carriers are used for generating switching pulses for the switches participating in the negative half cycle and hence these carriers are placed below the reference line. Other sinusoidal PWM techniques such as level-shifted reference, phase-shifted reference can be employed for the proposed topology. However the proposed topology yield lower harmonic distortion with level shifted carrier in-phase disposition sinusoidal PWM techniques compared to other modulation techniques and hence the same technique is employed to carry out the simulation studies. The modulation scheme employed and the switching pulses for the switches in the inverter circuit of the proposed topology are presented in Fig. 3.

C. Operation of the proposed topology:

The switches involved in generating various levels of output voltage across the load are presented in this section. To avoid the complexity in assessing the operation of the proposed topology, the MLBC circuit, MOSFET switch and the solar PV array are replaced with a single dc source with three dc link capacitors as shown in the fig. 4A.

To analyse the operation of the proposed seven-stage inverter, the voltages across the DC-link capacitors are taken as V_1, V_2 and V_3 across the capacitors C_1, C_2 and C_3, respectively. The sum of the voltages across the three DC link capacitors ($V_1 + V_2 + V_3$) is equal to the maximum amplitude of the output voltage. Since the voltage across each capacitor is equal, the magnitude of V_1, V_2, or V_3 must be one-third of the total peak output voltage. Therefore, the boost converter in the MLBC is switched by the magnitude of the required output voltage. However the maximum voltage that can be produced with the boost converter is two times the input voltage. Hence in the present scenario, the switch S_B can be switched with 50 percent duty cycle to produce output voltage twice the input voltage magnitude. However the switching duty of switch S_B is dictated by the Maximum Power Point Tracking (MPPT) algorithm which consider the output voltage and current as control parameters.

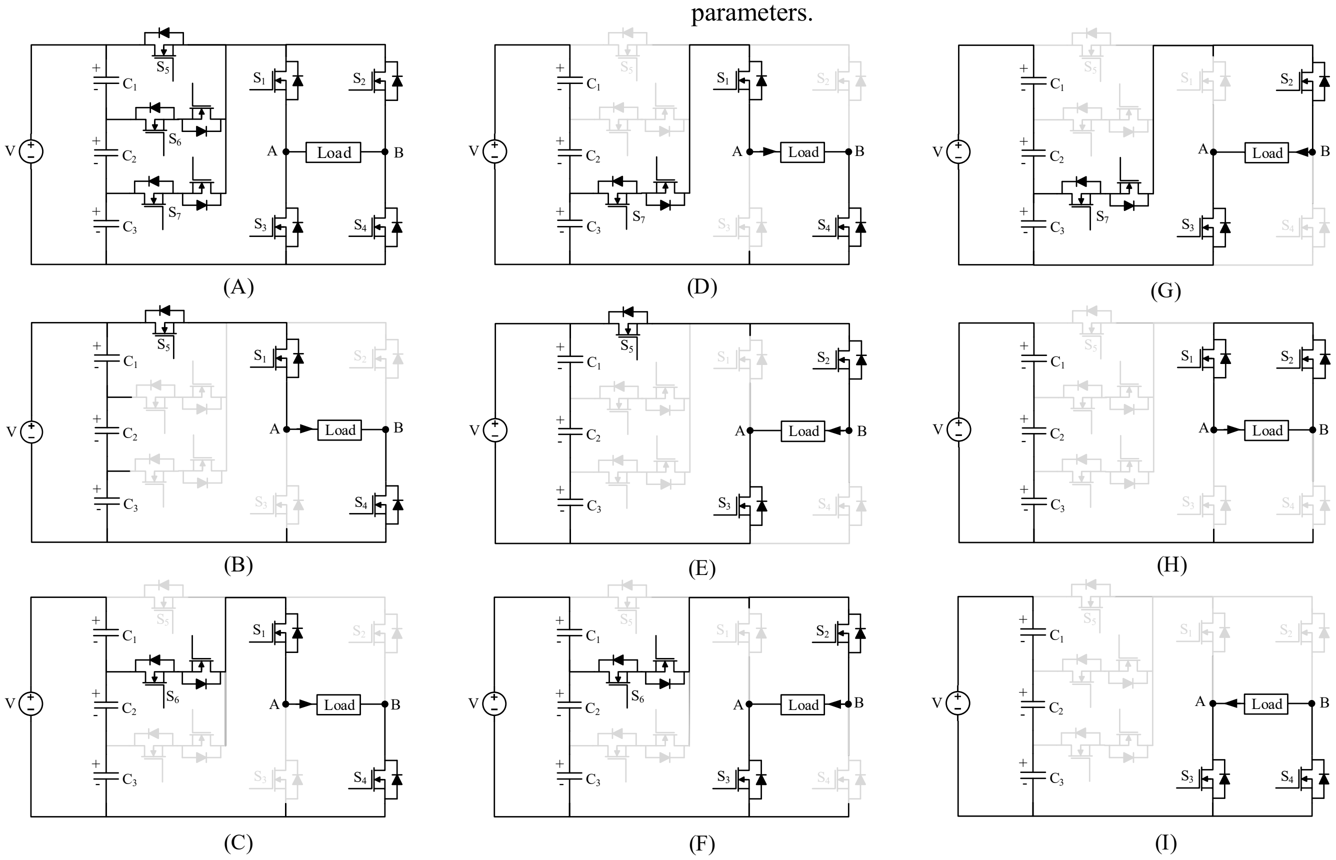


Fig. 4. Simplified representation of the proposed topology and its operating modes.

The voltage across each dc link capacitor is the same and such voltage is the magnitude of each voltage level of the output seven-level voltage. For easy understanding, we consider $V_1+V_2+V_3=Vdc$ which is equivalent to the peak output voltage magnitude and $V_1+V_2=V_2+V_3= (2/3)Vdc$. Similarly $V_1=V_2=V_3=(1/3)Vdc$ which is the magnitude of each voltage level in the output seven level voltage.

Switches S1, S2, S3 and S4 form the fundamental H-Bridge and act as the polarity generator circuit. The switches S5, bidirectional switches S6 and S7 along with dc link capacitors will act as level generator circuit for the proposed seven level inverter. During positive voltage level generation across the load terminals A and B, switches S1 and S4 are turned-on. Similarly, switches S2 and S3 are turned-on during negative voltage level generation. The voltage magnitudes of $\pm$Vdc, $\pm$(2/3)Vdc, $\pm$(1/3)Vdc are produced across the load terminals A and B, when the switches S5, bidirectional switches S6 and S7 are turned on respectively. Switches S1 and S2 or S3 and S4 are turned-on to produce zero voltage level. The switches involved in the generation of seven-level voltage are presented in fig. 4.

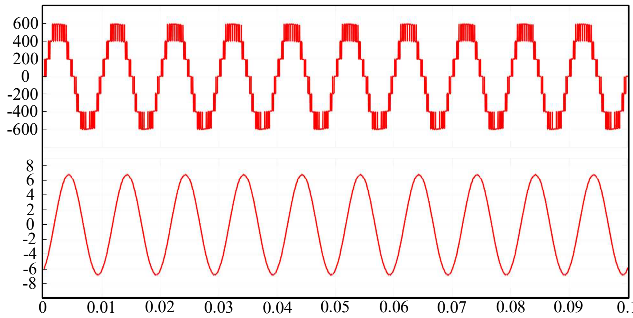
The switches involved and the path of the current for a voltage level of Vdc is presented in fig. 4B. During this level and the current flows from these dc link capacitors to the load through switches S5, S1 and S4. The current from load to source flow through the body diodes of the switches S5, S1 and S4. Since the free-wheeling of current due to the change in polarity or phase happens through the body diodes of the respective switches which are in conduction, they are not mentioned in the discussion further. Similarly, fig. 4C presents the current path for voltage level (2/3)Vdc. The capacitors C2 and C3 constitute the source and the current flows from these capacitors to load through bidirectional switch S6, switches S1 and S4. Fig. 4D presents the circuit for voltage level (1/3)Vdc. Capacitor C3 will act as source and the current flows from source to load through switches S7, S1 and S4.

Similarly, the switches involved and the path of the current for a voltage level of -Vdc is presented in fig. 4E. During this level and the current flows from these dc link capacitors to the load through switches S5, S2 and S3. Fig. 4F presents the current path for voltage level - (2/3)Vdc. The capacitors C2 and C3 constitute the source and the current flows from these capacitors to load through bidirectional switch S6, switches S2 and S3. Fig. 4G presents the circuit for voltage level (1/3)Vdc. Capacitor C3 will act as source and the current flows from source to load through switches S7, S2 and S3. The current free -wheels through switches S1 and S2 or S3 and S4 during the zero voltage level and the corresponding circuits are presented in fig. 4H and 4I.

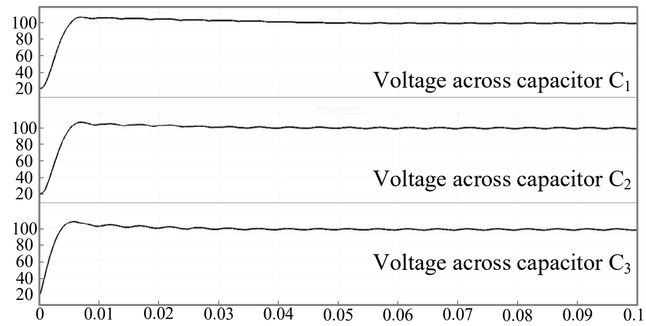
III. Simulation Results

The selection of proper size of Inductor and capacitor are important for designing of MLBC. The inductor size is defined based on the amount of ripple content in the current and the capacitors size is defined by the permissible ripple content in the dc link voltage. The size of inductor can be calculated as $L_B = (V_I D)/(\Delta I_I\ f_{sw})$, where V_I is the input voltage, D is the duty cycle of the switch in the boost converter, ΔI_I is the permissible ripple content in the input current and f_{sw} is the switching frequency of the inverter. Similarly the size of the capacitor used in the MLBC can be determined by $C_X=(P_R)/(4\Pi f V_{dc}\Delta V_{dc})$, where X ϵ 1, 2, 3, 4 and 5, P_R is the rated power, f is the power frequency, V_{dc} is the dc link voltage and the ΔV_{dc} is the ripple in the dc link voltage. Since the value of inductor depends on the switching frequency f_{sw}, the optimum value of the f_{sw} could be around 20 kHz for the proposed topology.

Simulations are carried out with a load of P_R = 2250W and the power factor considered is 0.5 lagging. A reactive load is considered for analysis to evaluate the performance of the proposed topology in handling reactive power. The input voltage V_I is considered as 100V, with duty cycle of D=0.5, V_{dc} = 600V, and the input current I_I = 25A. With these values, the value of boost inductor L_B is obtained as 0.5mH and the value of capacitance obtained is 996uF. An approximated value of 1000uF capacitance is for capacitors in MLBC circuit. The results for the output voltage, current, voltage across the capacitors in MLBC, dc link voltage, input dc voltage and the FFT analysis of the output voltages and currents are presented.



(A)



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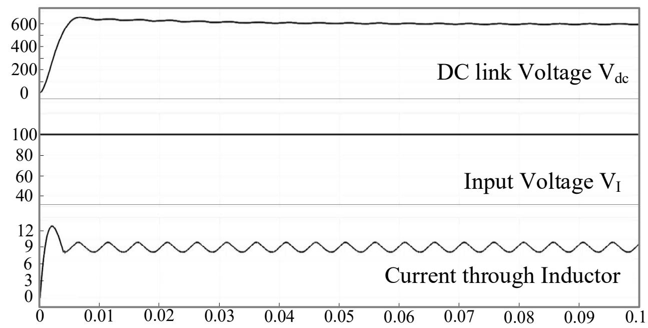

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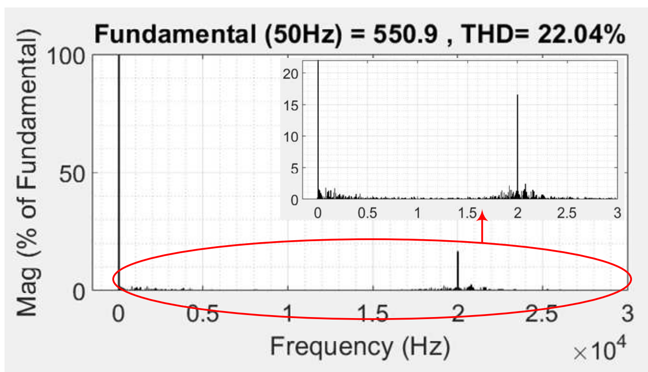

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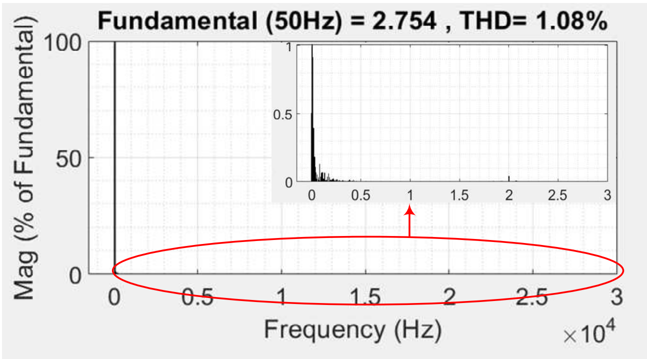

(E)

Fig. 5. Simulation results of (A) output voltage and current waveforms, (B) Voltage across the capacitors forming DC link, (C) DC link voltage, input voltage and inductor current, (D) FFT analysis of output voltage without filter, (E) FFT analysis of output current without filter.

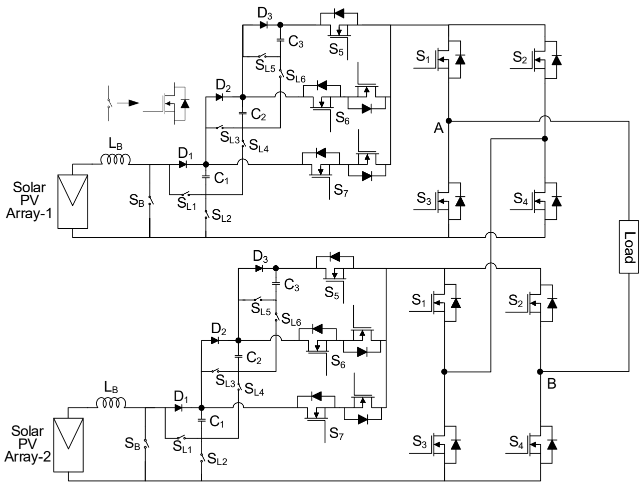

Fig. 6. Cascaded connection of the proposed topology.

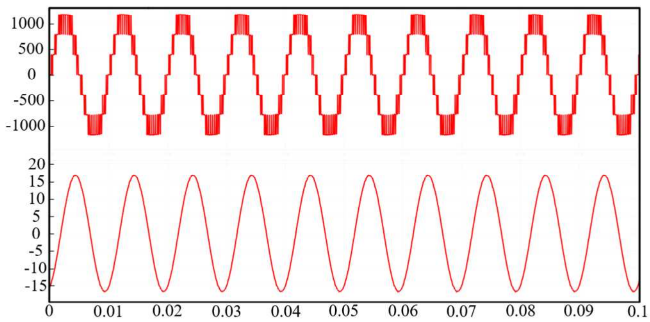

Fig. 7. Simulation results of the output voltage and current waveforms of the cascaded connection of the proposed topology for seven level operation.

The proposed topology can be cascaded to produce higher voltage magnitudes with increase in number of levels as well. A cascaded connection of the proposed topology is presented in fig. 6. The output voltage and current waveforms of the cascaded proposed topology operating in seven level mode and thirteen level mode are presented in fig. 7. The peak voltage magnitude in cascaded operation will be twice that of the individual operation of the proposed topology, however, the number of levels in the output is defined by the phase shift of the control signals of the individual units. The cascaded configuration can be operated in seven level mode by applying same control signals for respective switches in both the units. The switching signals fed to switches S_{1x} and S_{2x} (where $x \in 1, 2, 3, 4, 5, 6, 7$), are same and the thirteen level mode is obtained by introducing a phase shift of 60 degrees in between the control signals of each unit and the corresponding output voltage and current are presented in fig. 8.

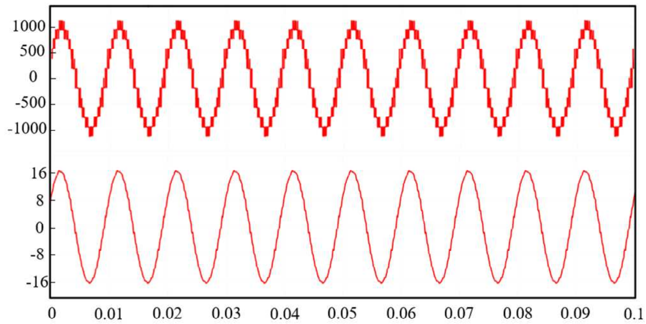

Fig. 8. Simulation results of the output voltage and current waveforms of the cascaded connection of the proposed topology for thirteen-level operation.

IV. Comparision of Proposed Topology

The proposed topology is compared with conventional topologies with respect to the total number of swicthing devices, diodes, capacitors, dc sources, etc., in designing the inverter topology. The proposed topology employs least number of components in design of inverter topology compared to conventional topolgies and is suitable for solar PV applications.

TABLE II. Comparision Table for the Proposed Inverter

Part Name	NPC	FC	CHB	Proposed Topology
MOSFET	12	12	12	9
Diodes	30	0	0	0
Capacitors	6	21	3	3
DC Sources	1	1	3	1

V. Conclusion

This study presents a two-stage seven-level inverter for solar PV systems. The inverter's input voltage is increased using a three-level boost converter. The suggested inverter is small in size but has a peak voltage magnitude of six times the input voltage across the output terminals. Control signals are generated using traditional sinusoidal pulse-width modulation techniques in the proposed architecture. The proposed topology is modular in design and may be expanded to provide larger voltage levels. To boost the output voltage magnitude, the proposed architecture can be cascaded. The performance of the proposed topology for higher voltage magnitude with seven and thirteen levels are also analyzed. Comparative analysis of the proposed topology with conventional topologies show that it requires least number of power circuit components for the inverter configuration. The simulation results prove that the proposed topology can be employed in solar PV applications.

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CERTIFICATE

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"ADVANCES IN SCIENCE, TECHNOLOGY AND INNOVATIONS"

edited by Dr. M. Anusuya, Dr R Rekha & Dr V Mohan

His/Her Chapter Title

"Growth and Characterization of Pure and 2-Picolinic Acid Doped L-Lysine Monohydrochloride Single Crystals"

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"Influence of Manganese (Mn) and Dysprosium (Dy) Doping on the Magnetic Properties of Yttrium Iron Oxide (YFeO3) Multiferroic Materials"

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Dr. M. Anusuya

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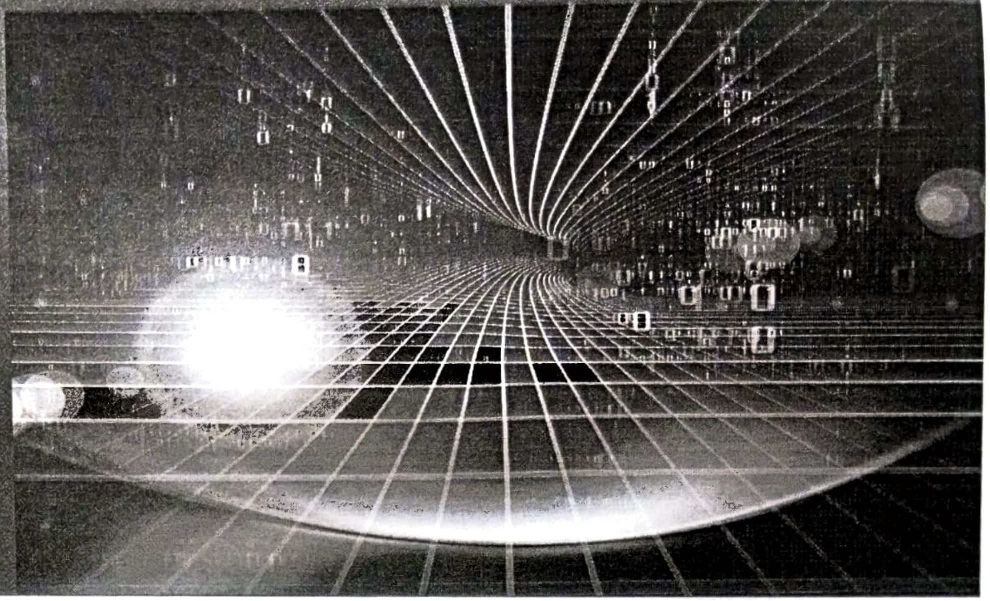
Ionic conducting materials can conduct electricity via the migration of cations and/or anions (highly mobile ions). Materials, which exhibit generally negligible (very less) electronic conductivity and high ionic conductivity in the range of 10-6 to 1 S cm-1 at below their melting temperatures, are termed as fast ion conductors (FIC), which are mainly used as solid electrolytes. Solid state ionic conductors differ from electronic conductors, e.g. in solid state ionic conductors conductivity is mainly due to ions and in metals and semiconductors, where the mobile charge carriers are electrons. Solids also exhibit both electronic and ionic conductivity in significant proportions, which are referred as mixed conductors. Mixed conductors are not suitable as solid electrolytes, because the electronic conduction leads to short circuiting. Instead of electrolyte material, mixed conductors are important electrode materials for battery applications.



P. Nageswar Rao
K. Veerabhadra Rao
K. Anuradha Reddy

Introduction to Ionic Conductivity of Glasses

Glass

Dr. P Nageswar Rao, Professor of Physics at Department of Science and Humanities, St. Martin's Engineering College, Telangana, Dr. K. Veerabhadra Rao Assistant Professor, Methodist College of Engineering & Technology, Hyderabad, Dr. K. Anuradha Reddy, Associate Professor in Physics, Methodist College of Engineering & Technology, Hyderabad.

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Physics for Freshman Engineers

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The present work experimental and simulation investigations have been carried out to study heat transfer, friction factor characteristics of a plain and twisted square ducts, with and without inserts. The experiments are performed for the airflow rate through the tested duct fitted with inserts for Reynolds number varied from 8000 to 40000. To reduce pressure drop and enhance heat transfer, twisted square duct is newly introduced without previous research available. The investigational work has been carried out and the experimentation is completely based upon design of experiments to get the optimum heat transfer rate and lesser pressure drop. Therefore the various process parameters studied are: temperature, velocity, mass flow rate, duct geometry, and shape of inserts. The pertinent parameters of tested duct elements include circular rod inserts, twisted shape square duct with twist ratio 6.12. Influences of these parameters on heat transfer and energy loss due to friction are studied in terms of Nusselt number and friction factor. It seems that twisted square duct is more potentiality in terms of heat transfer due to higher turbulence and twisted shape. It is observed

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Total experience in teaching -20 years

M.Udaya Kumar

A Novel Analysis and Developments in Heat Exchangers

Heat Exchangers

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Chapter 54
Comparative Study of Plain and Twisted Ducts in Heat Transfer

M. Udaya Kumar and Gadi Karthik

Abstract The experimental and simulation investigations are meted out to review heat transfer, friction characteristics of twisted and plain ducts. In the present work, Reynolds number varied from 7000 to 40,000 the flowing fluid is considered as air. Twisted duct is a new invention to reduce pressure drop and also increases heat transfer. The practical work has meted out and also experimental setup depends on plan of investigations to induce the best possible warmth transmit and less significant in pressure fall. Then, numerous parameters are such as: hotness, flow rapidity, mass flux, inserts. Twisted ratio of the duct is considered as 6.12. All values and analysis are considered in terms of Nusselt number and Reynolds number and friction factor. The outcome of the experiment shows that twisted duct Nusselt number shows 1.90 times more than the plain duct and also thermal performance of the twisted duct is obtained as 1.43. In this current work, numerical simulations are performed by using ANSYS 18.2FLUENT. In the present work hotness transmit, statistical flow patterns like heat transmit, frictional resistance graphs of twisted and smooth ducts are studied.

54.1 Introduction

Heat exchangers are mechanical appliance to pass on warmth power from one section to a different one by the use of exterior region. Al Mudhafa et al. [1] numerically investigated about new modified webbed heat exchanger, and these

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Please note that the LNCS editorial assumes that all authors have used the western naming convention, with given names preceding surnames. This determines the structure of the names in the running heads and the author index.

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EXPERIMENTATION AND STUDY ON METAL SPINNING OF PURE COPPER BY USING TAGUCHI METHODOLOGY AND REGRESSION ANALYSIS

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Abstract

The main purpose of the present work Metal spinning experimentation is to produce low cost rapid prototypes, as it consumes less duration and best economy. This study intends to define the critical parameters of spinning and optimize them using pure copper as the workpiece material. Design of experimentation is calculated using Taguchi methodology. The thickness of the workpiece, speed of the mandrel and the roller feed were considered as the three main spinning parameters. Regression model is framed by using statistical tool and analysis is done to compare the predicted values with the experimental results. In the present work to findout the optimum conditions and required components with good hardness and better surface finish.

Keywords*:* Metal spinning, Hardness, Surface Roughness (SR), Regression analysis, Taguchi methodology

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1. Introduction

Spinning is the process used for making cup shaped articles which are axi symmetric.The process of spinning consists of rotating the blank,fixed against the form block and then applying a gradually moving force on the blank so that the blank takes the shape of the form block. The machine is same as lathe in the head stock ,form block which has the shape of the desired part is fixed. The blank is held against the form block by means of the freely rotating block from the tail stock. After proper clamping the blank is rotated to its operating speed.The spinning speed depends on the blank material, thickness and complexity of the desired cup. Then roller type metallic tool is pressed and moved gradually on the blank so that it conforms to the shape of the form block.[1] . To produce a closed component, a spun shell could be made into halves which can be later welded to form a single unit without any complex or expensive tooling.

Due to the nature of the metal spinning process, its products are limited to those with concentric, axially symmetric shapes such as hemispheres, cones, funnels, flanged covers, parabolas, stepped parts and dished heads. Moreover, the size of the available metal spinning equipment limits the maximum practical diameter of the components produced.

Localized deformation of the material under the roller requires low forming forces. Moreover, simple and non-dedicated tooling provides flexibility and has the potential for net shape forming. Lastly, formed components have a high quality surface finish and improved mechanical strength[11]

2. Literature review

The sheet metal spinning process has been frequently used to produce components for the automotive, aerospace, medical, construction, and defense industries . In recent years, novel spinning processes are being developed which challenges the limitation of traditional spinning technology being used for manufacturing axisymmetric, circular cross-section, and uniform wall-thickness parts [2, 4]. Xia [5] developed a 3D non-axisymmetric spinning process, in which the workpiece was free from the rotational motion during processing and the roller set was installed on the main spindle and rotated together with the main spindle of the machine.

Kalpakcioglu proposed an idealized model to analyse the shear forming process whereby the disc blank is visualized as consisting of concentric thin cylinder sliding over each other axially and forming a cone while at the same time fulfilling the sine law.[3]K Essa and P Hartley et al [6] studied that spinning process is efficient in producing components with good characteristics and there is great flexibility in the process with a relatively low tool cost. The investigation has defined the critical working parameters in spinning and their effects on product quality characteristics, and also optimized the working parameters on Aluminum. The example used is the conventional spinning of a cylindrical cup. Optimization of the process is undertaken through the use of statistical analysis tools applied to the data produced from three-dimensional finite element simulations of the process. Sreenivasulu.G., et al [7] presented a suitable multivariate optimization procedure in cone forming process of Aluminum. In this paper, the effect of process parameters on the spun part surfaces characteristics, such as radial and longitudinal strain distribution are examined. Sandeep Kamboj, et al[8] studied the effect of different types of tools such as roller wheel tool, taper roller wheel and sheep's nose duck tools on spinning process using Aluminum as workpiece material

MayurTapse, et al [9] reported about the different parameters of spinning process with which good surface quality and good dimensional accuracy of the product is achieved. In this paper, classification of spinning, spinning terminology, design parameter and its consideration are introduced.Cheng et al. [10] developed a near-net shape forming process for manufacturing six-wedge belt pulleys by using 08AL steel sheets of 2.5 mm in thickness

A rigid tool is used to exercise manual spinning operation, which completely is predicated on one's skills. The equal practice is conducted on a manual lathe machine which results in material failure. Hence a soft tool, which is spring-loaded is required to overcome defects of the rigid tool [11]

3. Experimental Procedure

Over the last few decades, sheet metal spinning has developed significantly and spun products have been widely used in various industries. Although the spinning process has already been known for centuries, the process design still highly relies on experienced spinners using Trial-and-error. Challenges remain to achieve high product dimensional accuracy and Prevent material failures[12].Trials were done on copper on robust general lathe and listed in thetable1. Mandrel with an angle 64^0 as shown in fig 1a was considered for the experiments and the roller of hardened EN24 with diameter 62mm shown in fig 1b was used as the tool. The work pieces with different diameters were cut using abrasive water jet machine (AWJM) of OMAX 5500 series. The sheets were cut with a pressure of 3300 bar and with a abrasive flow rate of 0.45 kg/min. As illustrated in fig 1c , mandrel was held in the 4 jaw chuck and tailstock live centre was held in the tailstock to support the blank. Spinning roller was mounted on tool holder and which in turn was tightly secured on the saddle. The blank was clamped between the mandrel and tailstock holder. When spindle speed was given to mandrel, then mandrel and blank started rotating together along with the tailstock holder at high speed. Contact surfaces and cross slide were initially cleaned. It was ensured that the roller axis was parallel to the mandrel surface with help of dial gauge. Accurate adjustment of the cross slide was then effected so that the gap between the point of contact of the roller and the mandrel was the desired wall thickness of formed cup. When roller was pressed on the blank, forces were generated which caused the flow of the bank over the mandrel.

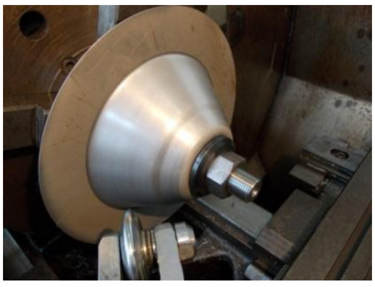


Fig 1a 64^0 Mandrel Fig 1bRoller of Dia Fig 1c Metal Spinning

PARAMETERS	TRIAL 1	TRIAL 2

Spindle speed	500 rpm	400 rpm
Dimensions	Ø200mm, thickness 2mm	Ø200mm, thickness 1.5mm
Depth of cut	1mm	1mm
Observations	Radial crack was observed at the end of the blank. This was occurred as the roller has been moved up to the end of the mandrel. The surface finish of the component was good as shown in the Figure 2a	The surface finish of component was good up to the first pass. Steps were observed at the end of each step as shown in the figure 2b
	 Figure 2a Trial 1	 Figure 2b Trail 2

Table 1: Trials on Copper material

Based on the observations, Experimentation Taguchi's method is used to design the experiments to know the effect of different process parameters on the performance measures. L9 orthogonal array is used, process parameters considered are spindle speed, feed rate of the roller and blank thickness shown in the table 2 whereas the performance measures are the surface finish of the final component, hardness before and after the spinning process that is the increase in hardness. These experiments were conducted on pure Copper. The mandrel used here is of an angle 60^o.

S No.	Thickness (mm)	Speed (rpm)	Feed (mm/rev)
1	0.8	200	0.06
2	2	210	0.2
3	4	240	0.3

Table 2.Variable parameters and their values.

The initial hardness of the blank and the final hardness of the formed component were tested using process hardness testing machine Subsequently surface roughness also be tested

4. Results and discussions

In this section, the effect of the process parameters such as: thickness,speed, feed on the surface roughness and Increase in Hardness is analyzed by using Minitab 19 Software. Experimental results of pure copper are shown in Table 3.

Exp. No.	Thickness (mm)	Speed (rpm)	Feed (mm/rev)	Initial Hardness (BHN)	Final Hardness (BHN)	Increase in hardness (BHN)	Surface Roughness (R_a)
1	0.8	200	0.06	71.5	251.5	180	1.32
2	0.8	210	0.2	71.5	247	175.5	1.42
3	0.8	240	0.3	71.5	232	160.5	1.38
4	2	200	0.2	62	217.5	155.5	1.25
5	2	210	0.3	62	222	160	1.3
6	2	240	0.06	62	212.7	150.7	1.28
7	4	200	0.3	61.5	192	130.5	1.10
8	4	210	0.06	61.5	212	150.5	1.05
9	4	240	0.2	61.5	203	141.5	1.18

Table 3. Experimental results (HR& SR) on Pure copper

4.1 The effect of the variable parameters on the Increase in Hardness

Figure 3 gives the variation of hardness with respect to speed, feed and thickness. It can be noticed that the increase in hardness is very low for the sheet with thickness 4mm. The sheet with thickness 0.8mm shows a good increase in hardness when compared to the other two sheets. For a speed of 210rpm, an increase in hardness was observed. It also shows that when feed is decreased, the hardness also decreased. It is noticed that the increase in hardness is maximum at feed 0.06mm/rev.

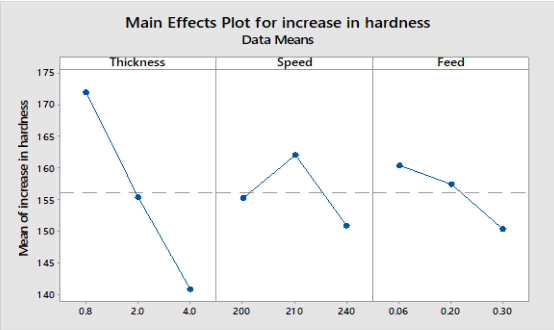


Figure 3 Variation of HR with process parameters

4.2 The effect of the variable parameters on the surface roughness

The effect of various parameters on surface roughness is shown in figure 4. It can be noticed from the graph that when the thickness of the sheet changes from 0.8mm to 2mm there is a decrease in the Ra value and further decreases when the thickness changes from 2mm to 4mm. With respect to speed, the minimum value of the surface roughness is observed at 200rpm and the next minimum at 210 rpm. The minimum value of Ra is noticed at 0.06mm/rev, next value at 0.3mm/rev and then at 0.2mm/rev.

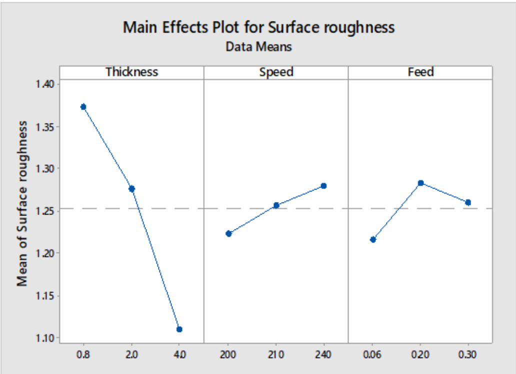


Figure4. Variation of SR with process parameters

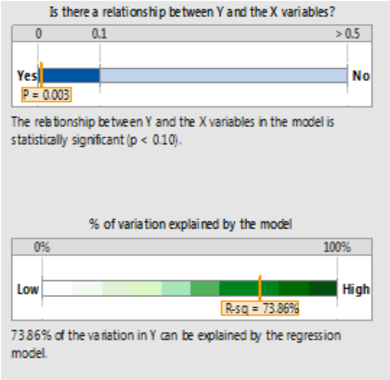
4.3 Regression Model

The regression model generated for Increase in Hardness and SR are given below

INCREASE IN HARDNESS (BHN) = 177.59-(9.49*Thickness) — (1)

SURFACE ROUGHNESS (µm) = 1.4401-(0.0824*Thickness) — (2)

From the figure 5a and 5bthe observations is that 73.86% of the variation in the increase in hardness can be explained by the generated regression model and 87.69% of the variation in the surface roughness can be explained by the generated regression model. For both Surface roughness and Hardness thickness is in the fitted equation that models the relationship between the input and output variables.



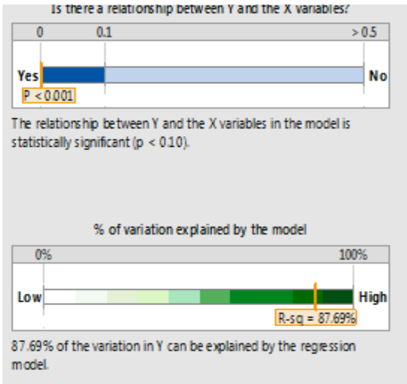
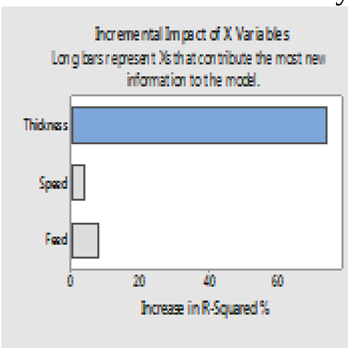


Fig. 5(a) Fitness variation for hardness Fig. 5(b) Fitness variation forSR

4.4 Impact of Variables on Hardness and Surface Roughness

Incremental impact of variables on Increase in Hardness and SR are also studied to know about which variable plays most significant role. Figure 6(a) shows that speed is insignificant, feed and thickness plays prominent role to enhance Hardness. Figure 6(b)It is clear from the graph of incremental impact of X variables, the long blue bar that the thickness has more impact on the surface roughness when compared with the other two parametersshows while increasing jet pressure which influences better surface finish is obtained by considering sufficient feed rate is maintained



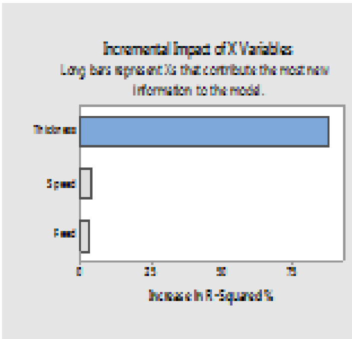


Fig. 6. (a) Incremental impact of variables on Hardness6(b) Incremental impact of variables on SR

4.5Maximization of Hardness

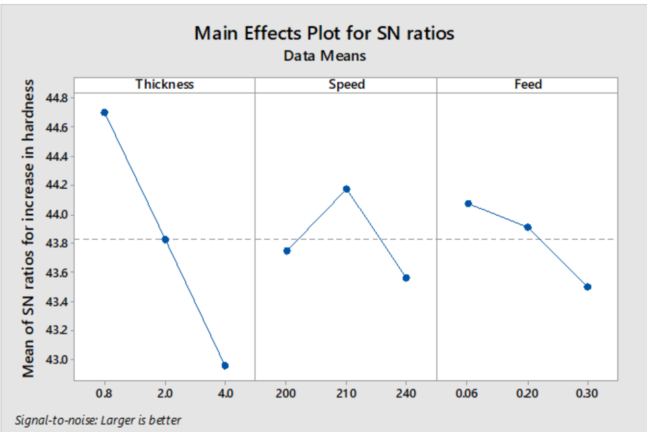


Fig 7: Graph showing parameter level vs S/N ratios for increase in hardness

Figure 7 shows the graph plotted between parameter level and S/N ratios for increase in hardness. From the table 4, it can be noticed that the delta value is more for the thickness parameter when compared with the other parameters. Therefore, it can be concluded that the thickness is the dominating parameter for the maximum variation of hardness whereas feed is less dominating parameter. From the response table 4, the maximum variation is considered as the optimum value. Hence, it can be concluded that by spinning a 0.8 mm thickness sheet at 210 rpm speed and 0.06 mm/rev feed, maximum increase in hardness will be obtained.

Level	Thickness(mm)	Speed(rpm)	Feed(mm/rev)

1	**44.7**	43.75	**44.07**
2	43.83	**44.17**	43.91
3	42.96	43.56	43.5
Delta	1.74	0.61	0.57
Ranking	1	2	3

Table 4.Response table for maximization of hardness (larger is better)

4.6 Minimization of Surface Roughness

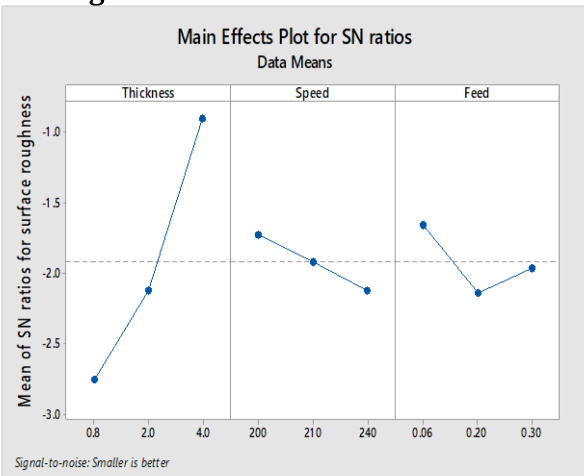


Fig 8: Graph showing parameter level vs S/N ratios for surface roughness

Figure 8 shows the graph plotted between parameter level and S/N ratios for surface roughness. From table 5, it can be noticed that the delta value is more for the thickness parameter when compared with the other parameters. Therefore, it can be concluded that the thickness is the dominating parameter for the minimization of surface roughness whereas speed is less dominating parameter. From the response table 5, the maximum variation is considered as the optimum value. Hence, it can be concluded that by spinning a 4 mm thickness sheet at 200 rpm speed and 0.06 mm/rev feed, minimum surface roughness will be obtained.

Level	**Thickness(mm)**	**Speed(rpm)**	**Feed(mm/rev)**
1	-2.7516	**-1.7258**	**-1.6598**
2	-2.1204	-1.9161	-2.1405
3	**-0.8964**	-2.1265	-1.9681
Delta	1.8552	0.4006	0.4807
Ranking	1	3	2

Table 5: Response table for minimum surface roughness (Smaller is better)

Validation of Experimental values versus predicted values is plotted in a graph and figure 9(a) and 9(b) no high differences or errors are seen .These indicate that the developed models satisfactorily represent the outputs.

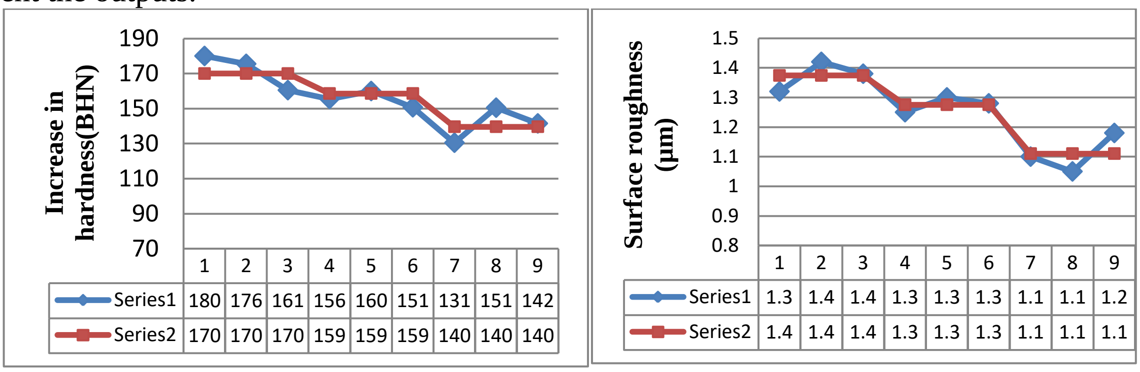


Fig. 9(a) Validation chart on HR9(b) Validation chart on SR

Conclusions

The following significant conclusions are drawn from the present work thickness is the most significant parameter influencing the hardness and surface roughness.

2. From the Taguchi methodology, maximum increase in hardness is obtained for 0.8mm sheet thickness, at 210rpm speed and 0.06mm/rev roller feed.
3. Minimum surface roughness is obtained for 4mm thickness sheet at 200rpm speed and 0.06mm/rev feed.
4. By using Regression analysis, it has been observed that the fitness variationis 73.86%for Hardness and 87.69 % for Surface roughnessis obtained

Acknowledgements

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Generally, Vehicle crash is considered as nonlinear transient dynamics phenomenon as impact causing car to stop with time frequency. The purpose of explicit analysis is to see how the car will behave in a frontal or sideways collision. Crash worthiness simulation is one type of application of finite elemental analysis (FEA). It is very effective to conduct nonlinear finite element simulations. The chassis frame is backbone of a vehicle as the whole deck is bolted to the chassis. The principal of chassis is to carry the maximum load which is designed for its operating conditions. The frame must support the components and the body for operating conditions and also it must with dynamic and structural conditions without any deflections. In this project, the car frame model is simulated and analyzed using ANSYS software for impacts and collisions in the frame. The designed model is tested under different collision conditions and the resultant deformation and stresses are determined with respect to a time of 80 Milli sec for ramp loading using ANSYS software. Explicit analysis is done on car frame in different directions using ANSYS software.

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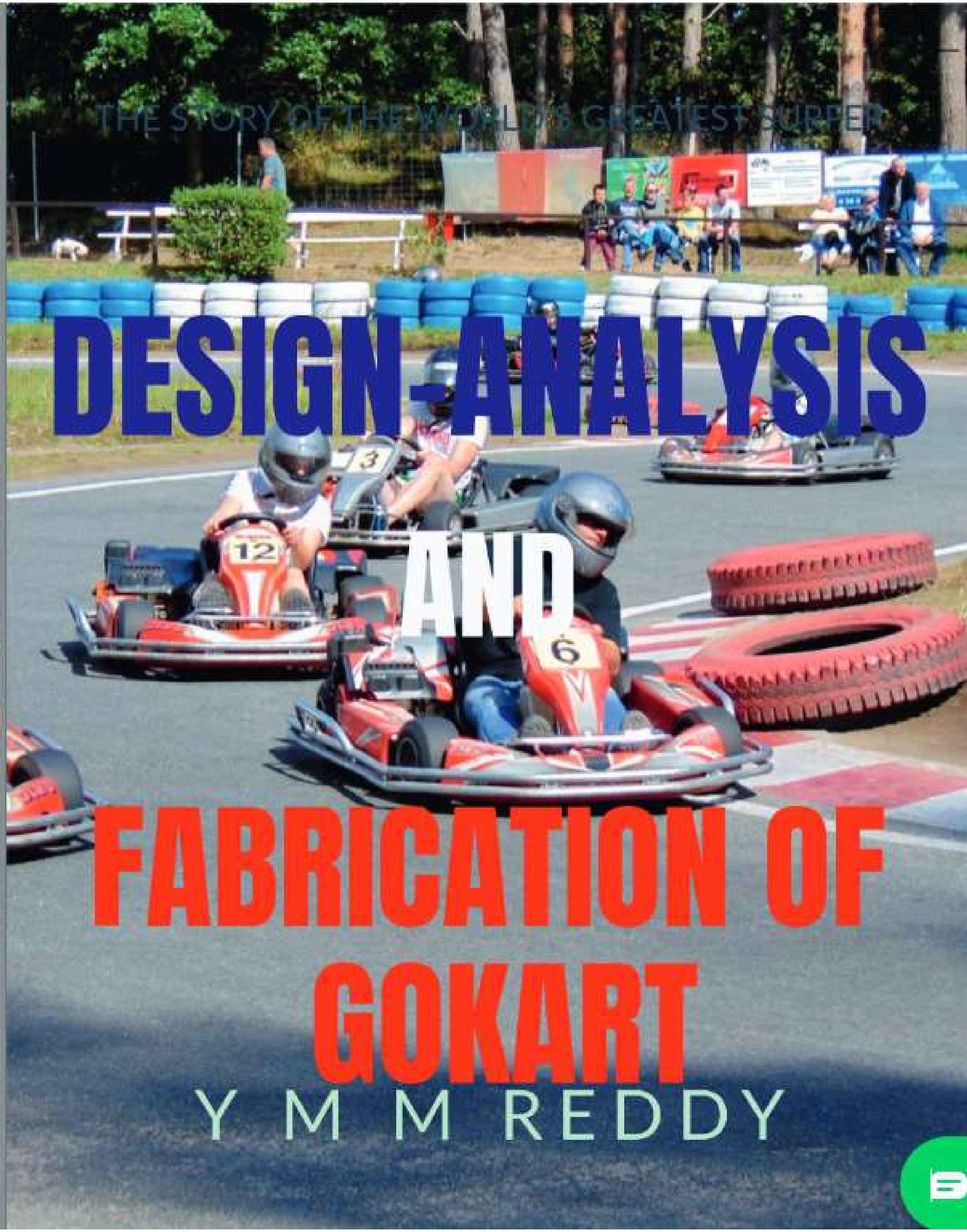

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The air cycle system functions by using air from either the engines or the Auxiliary Power Unit (APU). Airflow from the engines, as bleed air, or APU to the Air Cycle Machine (ACM or Pack) is controlled by various Engine Bleed valves and System Control Valves. The bleed airflow is modulated by Pack Flow Control Valves, and the air is thermally adjusted by means of air-to-air heat exchangers and Mix Valves.
An air cycle machine (ACM) is the refrigeration unit of the environmental control system (ECS) used in pressurized gas turbine-powered aircraft. Normally an aircraft has two or three of these ACM. Each ACM and its components are often referred as an Air Conditioning Pack.
The Air Cycle cooling process uses air instead of Freon in a gas cycle. No condensation or evaporation of a refrigerant is involved, and the cooled air output from the process is used directly for cabin ventilation or for cooling electronic equipment.

Md.Fakhruddin H.N

Air Craft Air Conditioning System: Description

There are four major systems that make up the air conditioning / cabin pressurization system on the Air Craft

An Associate Professor in Department of Mechanical Engineering, Methodist College of Engineering – Abids, Hyderabad – 500001_India. Having total experience of 26 years in which 5 years in industry, with 23 research papers published in reputed journals and reviewer for International Journal/Conference and a Subject Expert has delivered Invited Talk

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Compressor repair should be carried out only when it is made sure that the other parts of the system are trouble free. Minor repairs of the system can ordinarily be made without removing the compressor when compressor is worn out considerably it gives out of noise, its main bearing journals are worn out. In such a case it is better to use a new or reprocessed/rebuilt compressor than to attempt repairs particularly when the time and materials are of greater consideration. For the average engineer it is usually more economical to get the repairs done from a repairing shop than the major repairs himself. The following procedure may be followed to check the efficiency of a compressor.• Back seat the suction and discharge service valves and then remove the plugs.• Attach a pressure gauge to the discharge valve and a compound gauge to the suction valve port.• Check both the valves.• Start the compressor and throttle the discharge valve until pressure head of 9 bar is maintained.• Close the suction valve slowly and when it is completely closed note the vacuum on the compound stage.• The compressor may be considered as operating satisfactorily.

Md.Fakhruddin H.N.

Heating Ventilation & Air Conditioning-Maintenance

primarily four types of compressors used in the air-conditioning industry: Reciprocating, scroll, helical-rotary & cent.

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Safety from fire specifies the demarcation of fire zones, restriction on construction of building in each fire zone, classification of building based on occupancy, type of building construction according to fire resistance of the structural and non-structural components and other restriction and requirements necessary to minimize danger to life from fire, smoke, fumes or panic before the building can be evacuated. Safety of life is more than a matter of means of exits and accordingly deals with various matters which are considered essential to the safety of life.

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Md.Fakhruddin H.N.

Fire Fighting System Designing

When fuel attains the required temperature (flash point / fire point) in presence of oxidizing, then fire is initiated

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ARTICLE

Microstructure and Fracture Toughness Behaviour of Stir Zone of Friction Stir Welded Joint of AA7075 T651.

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